Webots-Blockly API Documentation

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Contents

1 Webots API Documentation

1.1 Important Terminology

arg.: Short for ”argument.” Used for listing arguments expected by the blocks.

con.: Short for ”connection.” Indicates that a block should be connected to the right of another block. The value returned by a block will be fed into the block to its left.

Initialize Blocks: The initialize blocks are the *setupMotor*, *initalizeGyro*, *intializeGPS*, and *initalizeOtherSensor* blocks.

Motor/Sensor Name: Each motor/sensor has a name that must be supplied to the initialize blocks - do not type quotes when supplying the name. The default names of the motors and sensors are listed in the descriptions of the initialize blocks. To manually find the name of the sensor, follow these steps:

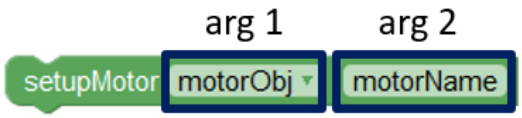
1. If the Scene Tree is not already open, press “Ctrl+t” to open it.
2. In the Scene Tree, click on the drop-down arrow for the bullet point that says “DEF ROBOT Pioneer3dx (PROTO).”
3. Click on the drop-down arrow for the bullet point that says “extensionSlot.”
4. A list of sensors will appear with their respective names listed in quotes.
5. To rename a sensor, click the drop-down arrow for the sensor you want to rename. Click on the bullet point that says “name.” Use the window that appears below to change the name.

Motor/Sensor Variable: For each motor, distance sensor, and color sensor that you use, you must create a corresponding variable to represent and reference those motors/sensors. Go to the "Variables" category, select "Create new variable...," and name your variable accordingly (e.g. "leftMotor," "distSensor," etc.). Supply this variable to the initialize blocks, which will bind a sensor/motor to the variable. We will refer to this variable as a motor variable or sensor variable, but remember that it is just a regular variable. You do not need to set your motor/sensor variables to any specific value - simply supply it to the various motor/sensor blocks as instructed.

1.2 Block Descriptions

Motors

setupMotor

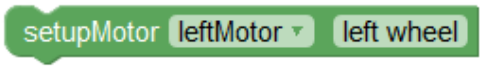


Description: Initializes a motor and binds it to a motor variable. **Must** be used before a motor can be referenced by other motor blocks.

Parameters

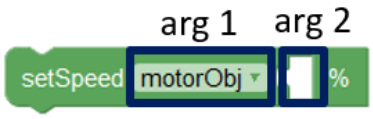
- arg 1: The motor variable to be bound to the motor.
- arg 2: The name of the motor you wish to bind - do not enter quotes. The names of the default robot's left and right motor are "left wheel" and "right wheel" respectively.

Example:



Binds the variable *leftMotor* to the robot's motor for its left wheel. When you use other motor blocks and want to specify the robot's left motor, you would then use the *leftMotor* variable.

setSpeed



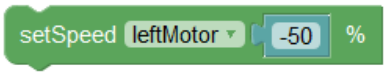
Description: Sets a motor at a specified percentage of its maximum speed. Uses positive percentage for turning forward and a negative percentage for turning backward.

Parameters

- arg 1: The motor variable of the motor you want to spin.

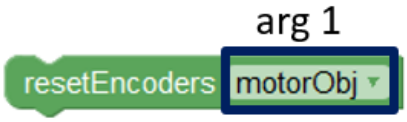
- arg2: The percentage of the motor's maximum speed you want to run the motor at. Accepts positive or negative integers or decimals from -100 to 100.

Example:



Spins the motor that is bound to the *leftMotor* variable backwards at 50% speed.

resetEncoders



Description: Resets the specified motor's encoder count (see *getEncoders* block for more information).

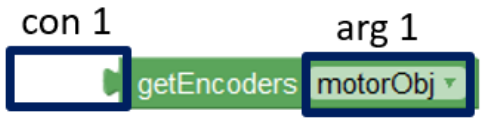
Parameters

- arg 1: The motor variable of the motor whose encoder count you want to reset.

Example:

Resets the encoder count of the motor bound to the *leftMotor* variable.

getEncoders

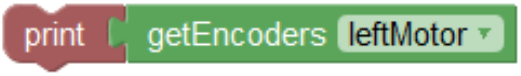


Description: As the motor revolves throughout the simulation, it keeps track of how many degrees it has rotated with an encoder count. Rotating forward increases this count and rotating backward lowers this count. This block returns the specified motor's encoder count.

Parameters

- con 1: The block that you want to feed the encoder count to. Accepts any block with a right connection.
- arg 1: The motor variable of the motor whose encoder count you want to retrieve.

Example:



Prints out the encoder count of the variable bound to the *leftMotor* variable.

Time

delay

Description: Suspends the program for a specified number of milliseconds. Note that the simulation will continue to run - only the program is suspended. This means that if a motor was rotating when the program arrived at the *delay* block, it will continue to rotate through the duration of the delay.

Parameters

- arg 1: The number of milliseconds to delay for. Accepts positive integers or decimals.

Example:

Suspends the program for 1 second.

getTime

Description: Retrieves the number of milliseconds elapsed since the last *resetTime* block. If there were no prior *resetTime* blocks, the number of milliseconds elapsed since the beginning of the simulation is returned.

Parameters

- con 1: The block that you want to feed the returned time to.

Example:

Prints out the number of milliseconds elapsed since the last *resetTime* block or the last *Start* block if there were no prior *resetTime* blocks.

resetTime

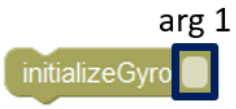
Description: Resets the timer that counts the number of milliseconds that have elapsed since the last *resetTime* or *Start* block - whichever was most recent. Note that this block will not reset the timer shown to the right of simulation's play button. It only resets an internal counter.

Sensors

The worlds you downloaded off GitHub automatically come with a Pioneer 3dx robot. This robot comes with 5 sensors:

- Gyro sensor named "gyro"
- GPS named "gps"
- Distance sensor named "distance sensor" and facing forward
- Color sensor named "color sensor" and facing down
- Camera named "camera" and facing forward

initializeGyro



Description: Initializes the gyro sensor. This block **must** be used before any other gyro sensor blocks can be used.

Parameters

- arg 1: The name of the gyro sensor - do not enter quotes. By default, the name of the gyro sensor is "gyro" - see the preface of the Sensors section to see how to find and/or change the name.

Example:

Initializes a gyro sensor with the name "gyro".

initializeGPS

Description: Initializes the GPS. This block **must** be used before any other GPS blocks can be used.

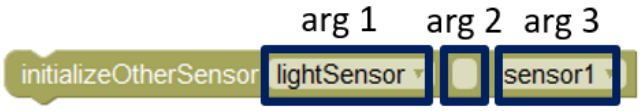
Parameters

- arg 1: The name of the GPS - do not enter quotes. By default, the name of the GPS is ”gps” - see the preface of the Sensors section to see how to find and/or change the name.

Example:

Initializes a GPS with the name “gps”.

initializeOtherSensor

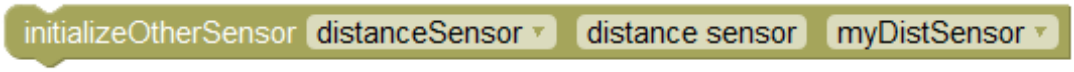


Description: Initializes a color or distance sensor and binds that sensor to a sensor variable. **Must** be used before any other color/distance sensor blocks can be used.

Parameters

- arg 1: Sensor type.
- arg 2: The name of the color/distance sensor - do not enter quotes. By default, the color sensor is named ”color sensor” and the distance sensor is named ”distance sensor” - see the preface of the Sensors section to see how to find and/or change the name.
- arg 3: The sensor variable to be bound to the sensor.

Example:



Initializes a distance sensor named “distance sensor” and binds it to the variable *myDistSensor*.

getGyroVals

Description: Retrieves the robot’s angle heading from the gyro sensor. The angle heading is a count that starts at 0, increases by 1 for every degree the robot rotates counterclockwise, and decreases by 1 for every the robot rotates clockwise.

Parameters

- con 1: The block to feed the angle heading to.

Example:

Prints out the angle heading of the robot.

getGPSVals

Description: Retrieves the robot's position from the GPS sensor.

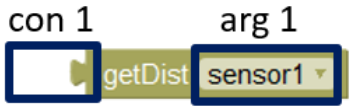
Parameters

- con 1: The block to feed the position coordinates to.

Example:

Prints out the angle heading of the robot.

getDist

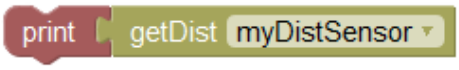


Description: Retrieves the distance seen by the robot's distance sensor in centimeters.

Parameters

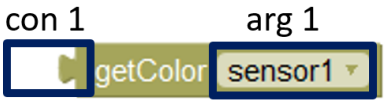
- con 1: The block to feed the distance value to.
- arg 1: The sensor variable for the distance sensor you want to probe.

Example:



Prints out the distance seen by the distance sensor associated with the variable *myDistSensor*.

getColor

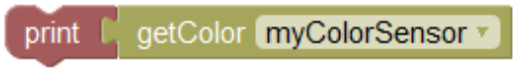


Description: Retrieves the color value of the floor underneath the robot from its downward-facing color sensor. Returns an RGB value (red, green, blue) as a list of three integers, each between 0 to 255.

Parameters

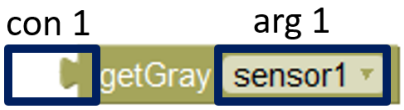
- con 1: The block to feed the RGB value to.
- arg 1: The sensor variable for the color sensor you want to probe.

Example:



Prints out the RGB value of the floor beneath the robot using the color sensor associated with the variable *myColorSensor*.

getGray



Description: Retrieves the brightness value from the robot's downward-facing color sensor (brightness of the floor directly under the robot). Returns a value from 0 to 255, with 0 meaning dark and 255 meaning light. Calculated by gray-scaling the RGB reading.

Parameters

- con 1: The block to feed the brightness value to.
- arg 1: The sensor variable for the color sensor you want to probe.

Example:

Prints out how light/dark the floor is beneath the robot using the color sensor associated with the variable *myColorSensor*.

Camera

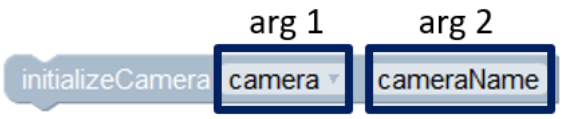
To simplify camera operations, Webots has added a system called recognition colors. Certain objects in your world can be assigned a recognition color, which consists of 3 different numbers from 0 to 1 that represent a color (an RGB value). To do so, follow these steps:

1. Press "Ctrl+t" to open the Scene Tree.
2. Click the drop-down arrow for the object whose recognition color you want to set.
3. Double click on the "recognitionColors" attribute.

4. Edit the red, green, and blue value in the window that appears below to set the recognition color.

Note that an object's recognition color is completely separate from its actual color - a blue box can have an orange recognition color. In turn, you can retrieve a list of all objects with a recognition color that are in the camera's view. You can then retrieve those objects' position and recognition color. We will refer to objects with a recognition color as recognition objects.

initializeCamera



Description: Initializes a camera on the robot and binds it to a sensor variable.

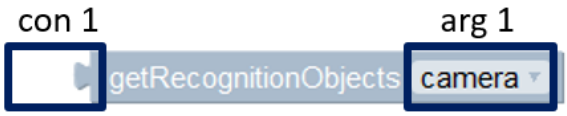
Parameters

- arg 1: The sensor variable to be bound to the camera.
- arg 2: The name of the camera.

Example:

Initializes a camera named "camera" and binds it to the variable *myCam*.

getRecognitionObjects



Description: Returns a list of all recognition objects in the camera's view.

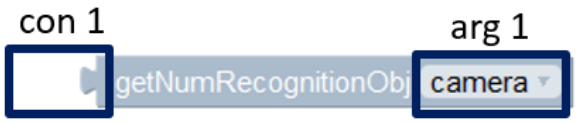
Parameters

- con 1: The block to which you want to feed the list of recognition objects.
- arg 1: The sensor variable of the camera you want to probe.

Example:

Prints a list of all recognition objects in the camera's view.

getNumRecognitionObj



Description: Returns the number of recognition objects in the camera's view. This value is also attainable by finding the length of the list returned by the *getRecognitionObjects* block.

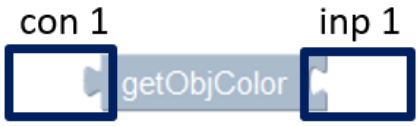
Parameters

- con 1: The block to which you want to feed the number of recognition objects.
- arg 1: The sensor variable of the camera you want to probe.

Example:

Prints the number of recognition objects in the camera's view.

getObjColor

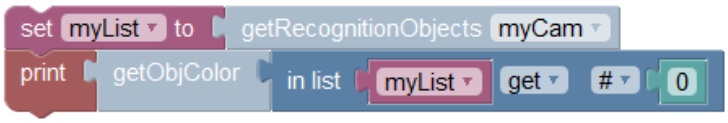


Description: Returns the recognition color of a recognition object in the form of a list containing 3 values from 0 to 1 (RGB).

Parameters

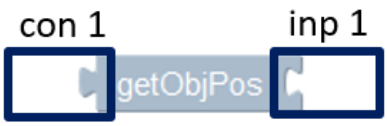
- con 1: The block to which you want to feed the recognition color.
- inp 1: The recognition object whose color you want to retrieve. Accepts a recognition object (an element of the list returned by the *getRecognitionObjects* block).

Example:

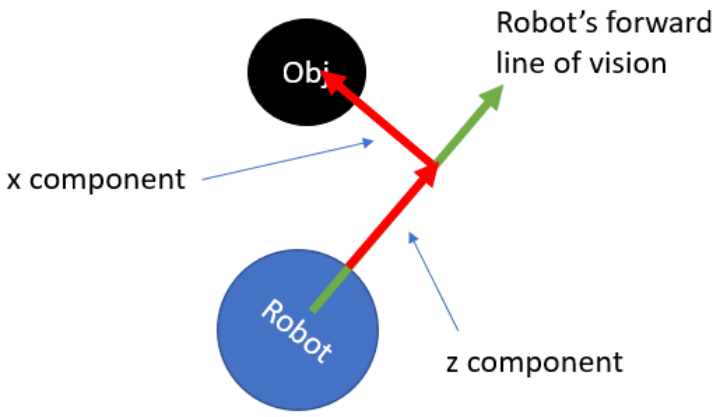


The first line retrieves a list of all recognition objects in the camera's view and stores it in the variable *myList*. The second line prints out the recognition color of the recognition object at index 0 of the list (first element).

getObjPos



Description: Returns the position of a recognition object relative to the robot's forward line of vision (see diagram below). The position is returned as a list of 3 decimals representing XYZ coordinates in meters with the robot at the origin.



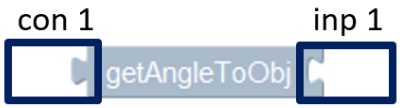
Parameters

- con 1: The block to which you want to feed the recognition object's position.
- inp 1: The recognition object whose position you want to retrieve. Accepts a recognition object (an element of the list returned by the *getRecognitionObjects* block).

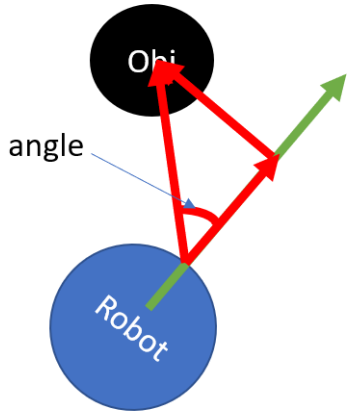
Example:

The first line retrieves a list of all recognition objects in the camera's view and stores it in the variable *myList*. The second line prints out the relative position of the recognition object at index 0 of the list (first element).

getAngleToObj



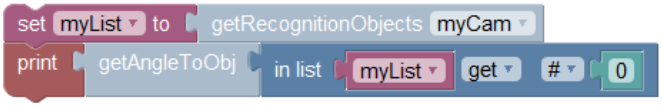
Description: Returns the offset angle of a recognition object relative to the robot's forward line of view (see diagram below). The angle is returned in degrees as a decimal from -90.0 to 90.0. A negative return value means the recognition object is offset toward the left and a positive return value means the recognition object is offset toward the right.



Parameters

- con 1: The block to which you want to feed the offset angle.
- inp 1: The recognition object whose offset angle you want to retrieve. Accepts a recognition object (an element of the list returned by the *getRecognitionObjects* block).

Example:



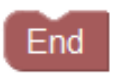
The first line retrieves a list of all recognition objects in the camera's view and stores it in the variable *myList*. The second line prints out the offset angle of the recognition object at index 0 of the list (first element).

Other

Start

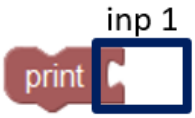
Description: Your programs **must** begin with a *Start* block, or else several internal variables will not be set.

End



Description: The *End* block is not necessary, but can be placed at the end of the program for aesthetic purposes.

print

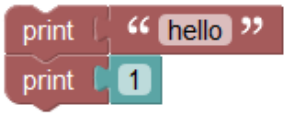


Description: Prints out a value to the console window with an automatic newline character at the end.

Parameters

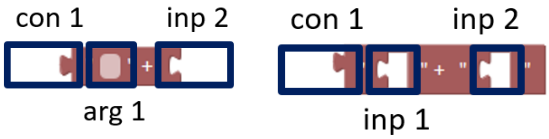
- inp 1: The value to be printed. Accepts anything.

Example:



Prints out “Hello” and then “1” on the line below in the console window.

String Concatenation



Description: Concatenates two strings together and outputs the result to a block. Can concatenate both string literals and variables.

Parameters

- con 1: The block to which you want to feed the concatenated string to.
- arg 1/inp 1: The string literal/variable that goes first during concatenation.
- arg 2/inp 2: The string literal/variable that goes second during concatenation.

Example:

Concatenates “hello ” with “there!” and passes the combined string (“hello there!”) to the print block.